N.A.C.A. BULLETIN

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EDITORIAL DEPARTMENT NOTE

Partial applications of standard cost data, perhaps not translated into dollars, may sometimes prove effective if applied to specific departments or operations for control purposes. Such an application, with development of efficiency ratios for jobs, men, machines, and departments, as well as detailed data for down time and other sources of indirect labor costs, is set forth in the first article in this issue.

This description is contributed by FRANKLIN G. JACK, Supervisor of Costs, Payroll, and Timekeeping at Wolverine Tube Div., Calumet & Hecla Consolidated Copper Co., Detroit, Mich. A veteran of World War I, Mr. Jack has had extensive industrial accounting experience since 1919. From 1924 until joining his present company in 1942, he was affiliated with H. J. Heinz & Co. or a subsidiary.

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The relative volume of payroll work, the significance of labor costs, the necessity of maintaining good personnel relationships, the reporting called for by payroll tax laws, and the record keeping requirements of the Fair Labor Standards Act are only the more outstanding considerations which have rendered payroll methods one of the most important subjects on the procedural side of industrial accounting. A payroll system which may surprise because of its achievement of results without extensive equipment is described in our second article.

E. W. JACKELS, the author, has been Director of Factory Accounting at Universal Match Corp., St. Louis, Mo., since 1937. Earlier, Mr. Jackels was employed as cost accountant with American Air Lines and in general accounting posts with J. C. Penney and International Shoe Co.

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Fixed costs, that heavy and insoluable precipitate at the bottom of the conventionally drawn flexible budget chart, would take up a smaller proportion of initial sales volume if investments in fixed assets and other sources of long-term costs were always considered from the control point of view. This is true in an important way with public utilities, for which our third article outlines briefly means for maintaining such a review of capital projects, and it can well be true to a like extent in many industrial companies.

The author of the article is RUSSELL G. HOUCK, Auditor of Affiliated Companies, Edison Light & Power Co., York, Pa., with which he has been connected for more than twenty years, after initial accounting experience with Hanover Cordage Co., Hanover, Pa.

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The financial and cost accounting aspects of the handling of accounts payable are not always equally well served. It is often such a major task to process accounts payable detail to the point of payment, with due regard to necessity of internal control, that distribution procedures are sketchily developed. Our fourth article describes a concise accounts payable routine, one feature of which is to readily permit analysis of the cost side of the picture.

The author of the presentation is R. W. DONALDSON who, for the past seven years has been on the Staff of the Controller's Office of Armstrong Cork Co., Lancaster, Pa. Prior connections have been with the American Express Co. as Financial Representative and in the banking field.

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November 1, 1948

APPLICATION OF OPERATION TIME STANDARDS TO DEPARTMENTAL LABOR COST CONTROL

by FRANKLIN G. JACK,
Supervisor of Costs, Payroll, and Timekeeping,
Wolverine Tube Div., Calumet & Hecla Consolidated Copper Co.,
Detroit, Mich.

THE Wolverine Tube Division is engaged in the production of nonferrous tubing. The operation is governed almost entirely by the type of orders placed by our customers. The sizes, shapes, and metallurgical properties run into many thousands of specific items. To attempt to cost each of these separately would be an almost endless task and the results could not be too accurate at the best. For the same reasons, standard costs present many problems. Hence, the greater part of our cost data is accumulated as actual process costs by class of product with a small part as job costs.

Because of these problems of accounting and also to gain more knowledge of the actual costs of certain lines which were not showing favorable results, we installed a timekeeping and cost control system, employing time and production data only, in the departments in which these lines were processed. It is with this system that the present article is concerned. The system was started in July 1946, and has operated to good advantage since that time. Results in the original three measured departments have been so uniformly good that the plan has been extended to five other operating departments. Early indications are that these will react just as favorably in our aim toward making savings by the elimination of waste of time and materials.

In the departments in question, the timekeepers are on a salary basis and report to their supervisor in the cost accounting department. Their first duties are to record time and production and, second, to relieve production staffs of all duties which can be handled along with the first duty. Thus the supervisor of costs, who also is supervisor of timekeepers and factory payroll, has control of the distribution of labor cost to a much greater degree than is possible when original entries are made by workers.

Daily Time and Production Detail

After considerable experimenting, we developed a printed columnar form of Daily Labor Control Report (Exhibit 1) which picks up such basic data from the workers' job time tickets. From

LABOR CONTROL

DEPT. 40 SHIFT 1 DATE April 14, 1948 PAGE 2

MAN NO.	MCH. NO.	SIZE O.D.	SIZE WALL.	SIZE LGTH.	MISC. / PT.	ALLOY	PROD.	TIME HRS.	TIME MIN.	OPER. NO.	MILL ORDER OR PART NO.	STANDARDS MIN. 100 UNITS	STANDARDS STD. MIN.	STANDARDS SET UP	STANDARDS TOT. STD. MIN.	JOB EFF.	TOTALS ACT. MIN.	TOTALS STD. MIN.	TOTALS % EFF.
616	402	1-3/4	180	11'		130	1300	.6	36	200		2.940	38	5	43	119			
"							--	.5	30	405		--	-	-			30		
"	"	2"	300	6'		120	600	.5	30	200		3.849	23	5	28	93			
"	"	2"	S.P.S	14'		128	5400	3.0	160 (20)	200		2.701	146	5	151	94			
"	"						--	.8	48	442		X	-	-			48		
"	"	1-1/2	130	17'		130	1500	.5	30	201		2.576	39	5	44	147	402	370	92
"	"	1-3/4	180	12'		151	3500	2.1	126	200		2.842	99	5	104	83	(480)		
									(480)										
351	403	1/2	S.P.S	41'		128	5210	2.3	138	201		1.897	99		99	72			
"	"						--	1.9	94	421		M	-	-	-		114		
"	"	840	100	22'		128	5900	2.2	132	201		1.985	117	5	122	92			
"	"	1/2	S.P.S	41		128	3300	1.3	78	201		1.997	63	5	68	87			
"	"							.3	18	442		Z					18		
									(480)								348	289	83
									(480)								(480)		
366		Crane Man Dept.			40			5.5	330	417									
"		Crane Man Dept			44			2.0	120	417									
"		Crane Man Dept			60	L. Truck		.5	30	448									

EXHIBIT 1

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it, by way of totals or summary, it is possible to develop efficiency percentages applicable to individual machines, workers, operations, shifts, or departments and to obtain information breakdown of time spent on indirect work or nonproductively. As illustrated the report represents a copy of a sheet prepared by a shift timekeeper, and details the activity of three men of whom two are productive operators and one a crane operator. From the reference made to efficiency ratings it will be correctly assumed that in the departments to which the plan applies we have time standards for principal operations. These standards are established by our industrial engineering department and include allowances for all constantly recurring reasons for lost time except a twenty-minute lunch period for which employees are paid. The lunch period is not included in the efficiency rating of the job being done at the time it occurs but is calculated as a part of the total actual minutes measured by standards for the day.

It will be noted that the daily labor control report identifies operators and operations and includes production quantities, actual time, standard time, job efficiency, and operator efficiency. Entry of the data is grouped by individuals, as operator performance is regarded as primary information sought. The "actuals" as to time, production, etc., are transcribed from the time ticket, one of which is made for each job, whether it be a direct or indirect labor operation. The standard per 100 units is entered from sheets supplied by the industrial engineering department and standard minutes are calculated as unit production times the standard. Setup time is taken from the standard sheets. As the shift progresses a running record is maintained for each worker so that at the end of the shift the labor cost control sheet shows a total of 480 minutes per man. The time also can be taken by machine. All operations whether productive, nonproductive, or indirect are shown and, should a man arrive late or work part time in another department, this is detailed on the control sheet.

Letter Coding of Nonproductive or Off Standard Operations

Each direct and indirect operation is coded on the report. It is perhaps in the letter codes for indirect or nonproductive categories that our setup may be regarded as distinctive. Any idle time of an operator is charged as machine breakdown or waiting time and each of these codes is further subdivided to indicate the more specific reason for the lost production time, as follows:

Machine breakdown	Waiting time
M. Repair requiring millwright work.	W. Work assignment.
E. Electrical repair.	X. Tools or setup.
	Y. Authorized personal business.
	Z. Waiting for stock.

There is also a code for the information of the industrial engineering department in connection with jobs which might be but are not covered by standards:

A. No standard set.
B. Off standard due to poor stock.
C. Off standard, faulty dies, tools, fixtures, or equipment.
D. Equipment or crew different from base of standard.

At the close of each shift, the labor control sheets are sent to the accounting department office where clerical timekeepers inspect them to make sure that proper entries appear in every column and to verify the standards applied as well as the calculation of standard minutes (production times the standard per 100 units). Following this checking, the percentage of efficiency is calculated for each job performed by each man and an over-all efficiency for all jobs done by each man where standards apply. In the final column of the form, in addition to the over-all efficiency, nonstandard time is entered and all data balanced to 480 minutes (8 hours) total for each worker.

Shift and Department Reports

The labor control report data results initially in daily reports which find their way back to the supervisors concerned before the next day has passed. These reports are intended to effect a sort of instant control. First, the departmental totals are summarized

SHIFT SUMMARY

Item	*Actual*	*Standard*	*Per cent*
Direct labor	3156	2457	77.9 EFFICIENCY
Nonstandard labor	162		3.5 OF TOTAL
Indirect labor	840		18.3 OF TOTAL
Nonproductive direct labor	—		OF LABOR
Down time	438		9.5 OF LABOR
Total	4596	2457	

EXHIBIT 2

DEPARTMENTAL LABOR SUMMARY

Dept. No. 46 Date: April 17, 1948

Shift	Direct Labor				Indirect Labor												Ft. str.
	Act. min.	Std. min.	Per cent Eff.	Non. std. min.	Non. prod. min.	Operation number						Down time		Total min.			
						405	417	425	432	428		421	442				
1	3,456	2,878	83.3	558		30	480			480				5,004			57,585
2	3,924	3,351	85.4	144			480			252				4,800			95,155
3	2,082	1,627	78.1	444		60	210	60		420		84		3,360			28,119
Total	9,462	7,856	83.0	1,146		90	1,170	60		1,152		84		13,164			180,859
Cum.	184,248	153,182	83.1	28,336	60	996	20,100	702		13,852		660	852	249,806			2,241,603
To date	193,710	161,038	83.1	29,482	60	1,086	21,270	762		15,004		660	936	262,970			2,422,462

EXHIBIT 3

by shifts. The summary is attached to the original of the labor control sheets and sent to the production department for the guidance of the supervisor. These summaries carry the data listed in Exhibit 2 for each shift. Their relationship to the basic data developed on Exhibit 1 will be readily apparent. A second statement is also issued which gives more comprehensive details as to shift operations and production. Exhibit 3, Departmental Labor Summary, illustrates a day's activity in this detail. In this report indirect labor is broken down by individual operation numbers. Data accumulated to the current date in the month are included below the day's performance so that supervisors can spot trends.

From the various records described, ledger sheets are likewise posted for each machine, in which actual and standard minutes are recorded on a daily and cumulative basis. Charts or graphs, extended on a weekly basis for the machine efficiencies and daily for the items included in Exhibit 2, are passed to mill supervisors for their information. Our continuous three-shift day ends at 7.30 a.m. and we try to hurry the information back to the mill.

Control Conferences and Reports

Biweekly a meeting is attended by departmental supervisors involved, mill supervision, industrial engineering and timekeeping departments, with the division internal auditor as moderator. The operating results obtained in the various departments are summarized and submitted to all present in mimeographed form. Exhibit 4 exemplifies this information for one department. It will be noted that the form calls for data for three prior months and the current month to date. Additional copies are provided for assistant supervisors on other shifts who are unable to attend the meetings and for the general manager and factory manager.

COPPER MILL EFFICIENCES
Department 24

	January	*February*	*March*	*Apr. 1 to 9*
Final Dept. Eff.	79.5%	83.2%	86.2%	83.3%
Per cent down time to total min.	0.4%	1.1%	1.2%	1.6%
Per cent of indirect labor to total min.	10.0%	10.9%	10.4%	9.6%
Per cent of Nonstd. min. to total dir. min.	70.3%	44.0%	47.2%	47.1%
Total Ftg. Str'd.	6,517,575'	5,376,156'	14,022,935'	6,357,648'
Per D. L. Hour	1,157'	1,175'	1,307'	1,317'

EXHIBIT 4

The high lights are brought out by the moderator in discussion and any unusual items are talked over to determine the reasons for any deficiency apparent in the operation as portrayed by the reports. Major attention is directed to nonstandard time and waiting time which is split into shift data to facilitate comparisons and is presented in full code detail as set forth in Exhibit 5. All questions are settled so far as possible at the meeting. Nevertheless, the moderator later issues minutes of the meeting which provide an agenda for the next one. When possible, data required to answer questions carried over are developed in time to be inserted in the minutes, or the information is supplied to the production supervisor by memo or by verbal advice in preference to waiting until the next meeting.

OFF STANDARD AND WAITING TIME—APRIL 1 to 9, 1948

Department 29

Direct Minutes Off Standard

Total direct minutes	193,332	
Total direct min. off std.	15,570	8.0%

Code	Item	Minutes	Per Cent
A.	No standard set	12,312	6.4
B.	Off standard, bad stock	2,310	1.2
C.	Off standard, faulty dies, tools, fixtures, or equipment	888	.4
D.	Equipment or crew used other than standards were based	—	—
	Saw scrap	60	.03
	Total	15,570	8.0%

Down Time

Indirect Operation No. 421-442

Total minutes	225,468	
Indirect minutes	5,196	2.3%

Code	Item	Minutes	Per Cent
W.	For work assignment	—	—
X.	Tools or setup	378	.2
Y.	Personal authorized business	30	.01
Z.	No stock, or waiting on crane	3,318*	1.5
	Operation #421, machine breakdown	1,470	.6
	Total	5,196	2.3%

	Minutes	Per Cent
First shift	1,278	38.5
Second shift	1,200	36.2
Third shift	840	25.3
Total	3,318*	100%

EXHIBIT 5

What the Plan Has Achieved

The cost control plan is not part of a pay incentive plan, other than may be implied in the fact that increased production reflects itself in the mill-wide incentive plan. Despite this, there is a highly cooperative spirit existing among production workers and supervisors, and the industrial engineering, timekeeping, and cost departments. All are working together to eliminate waste of all types. The plan provides departmental supervisors with an excellent tool and they are making such good use of it as to produce profitable results. Without attempting to give weight to any specific factor, we have certain known information relative to this

group of standard measured departments which is not available for other departments of the mill. These factors are:

1. Efficiency has shown a constant up-trend since the inception of the system.
2. The cost of down time for all purposes and reasons decreased more than 60 per cent in the last half of 1947 and continues to decrease.
3. Indirect labor cost has decreased approximately 25 per cent.
4. Nonstandard time has decreased 72 per cent in one department, 50 per cent in a second, and held constant in the third.
5. Production per hour of direct labor increased about one third.
6. Despite higher labor rates per hour and even higher proportionate increases in burden costs, the unit costs in the departments measured showed less than 20 per cent as much increase as might have been justified by these increased costs.
7. The increased productivity in 1947, as compared to August 1946, the second month of the plan, was equivalent to a gain double the cost of the standards and timekeeping operations.

The control system is not tied in directly with general ledger accounts in any way but is designed to control labor cost at its very source, with the assumption that if that cost is in line day by day, the month-end data should be favorable. Wolverine Tube Division has other plans of control in force, including an expense exhibit or variable budget, a mill incentive plan, and a supervisors' incentive plan. All of these contribute somewhat to the gain mentioned and should be given a part of the credit.

The cost control system, as now in use, is the refined result of many changes and experiments. The forms and reports generally are those devised to supply mill supervisors the information they desire to enable them to get better results. In supplying the necessary information, the members of the accounting department involved have gained considerable knowledge of mill conditions affecting cost, and the mill supervisors have become cost conscious to a great degree. Our experience has been such as to justify the expenditures made and, unless radical changes occur in conditions, we expect the plan to continue to function profitably.

A PAYROLL SYSTEM USING GENERAL PURPOSE OFFICE EQUIPMENT

by E. W. JACKELS,
Director of Factory Accounting,
Universal Match Corp., St. Louis, Mo.

THE system presented here features the use of typewriter equipment as distinguished from manual operation of payroll records or the employment of fully mechanized equipment for this purpose. It is suitable for payrolls involving from forty or fifty employees up to four or five hundred and is designed to eliminate errors in posting individual earnings records and thus reduce to a minimum the time required to prepare the quarterly payroll tax returns. It is especially suitable for payrolls prepared in a branch factory or office because it provides for effective home office control. This paper is devoted to the mechanics of its operation.

For many years our organization used manual records and followed the simple practice of calculating an employee's earnings on his time card, writing a pay check on a typewriter, and writing up a separate payroll journal sheet. When payroll taxes came into being, we added to our setup a hand-posted ledger page for each employee. This made four basic operations and finally became too burdensome. We then purchased a rather expensive machine which was to handle the payrolls for all of our plant units in the same section of the country as our home office. However, we also operate several factories in scattered locations from New York to California. Because of the distance, payrolls for these outlying plants could not be prepared at the central office. Since none of these factories employed more than 400 people, it was uneconomical to go to any great expense for mechanical equipment.

Available Systems: Pegboard and Machine Types

In thinking out the problem, it appeared to us that the fundamental mechanics of a good payroll system should provide for writing an employee's earnings statement, a payroll journal, and an individual earnings record all in one operation. Some include the writing of the check in the same operation. This type of procedure eliminates the errors that are bound to be made if information is posted from one record to another. It also saves the time otherwise spent in posting and, because there are no posting errors, balancing the

individual earnings ledger with the payroll becomes less of a problem. In many cases, an extra one or two copies of the payroll journal sheet, which such a setup may provide, are also needed.

However, payroll systems now on the market, which may be divided between the handwritten pegboard type and the machine-written types, did not appear to offer exactly what was wanted in our case. The handwritten systems do provide for writing all three records in one operation. They have a serious disadvantage in that the earnings record and the payroll journal are carbon copies of a handwritten record. If the figures are to be clear, the payroll clerk must have heavy yet legible handwriting and if extra copies of the journal sheet are attempted, the carbon impression is unlikely to be readable. Only for a very small business requiring only one copy of the payroll journal would the pegboard system seem adequate. Payroll writing machines will answer all the requirements mentioned, and in addition, they will cross foot and carry totals in several registers. This eliminates additional adding machine or comptometer work. Undoubtedly, the best way of handling a large payroll is to select one of the machine systems. But these machines generally cost several thousand dollars, which is surely not an economical investment if the machine is to be used only one day a week. Another important consideration in connection with the machines is the availability of repair service. If the machine balks in the middle of a payroll, considerable embarrassment may result.

Adapting Typewriter Equipment

We decided to adapt typewriter equipment to payroll use. Compared to the handwritten methods the typewriter would prepare neat, legible work and provide extra copies of the payroll journal sheet. As compared with mechanical equipment designed for payroll, the typewriter has the advantages of requiring a small outlay, offering fewer breakdown hazards, and calling for no special training of operators. But, it must be specialized.

Most payroll writing machines operate with the journal sheets held in a fixed position around the platen. The checks and earnings record forms are individually inserted in front of the journal sheet. Payroll details are then typed on the check stub and transferred through carbon paper to the individual earnings record (check stub duplicate in our case, as noted below) and to the journal sheets. This operation cannot be performed on an ordinary

typewriter because the check and earnings record cannot be inserted without disturbing the journal sheets. It is possible, however, to obtain an electromatic typewriter equipped with a "lift platen." This makes it possible to lift the platen and insert papers from the front of the carriage without disturbing the sheets which have previously been inserted around the platen.

In order to make it possible to position the payroll check quickly, we invented a pair of small guides to ride on the margin stop bar located just behind the platen. These guides receive the check as it is thrown in from the front of the carriage and position it both vertically and horizontally. We eliminated the problem of positioning the employee's earnings ledger card by substituting for it a copy of the check. The guides do not interfere with the use of the machine for other general typing. Because the machine is electrically driven, the impression regulator can be set heavy enough to give clear carbon copies.

For a smaller payroll (about 40 employees), we purchased a standard typewriter equipped with a simple device which also makes it possible to insert the check from the front of the carriage without disturbing the payroll journal sheets. This device is a thin metal pan which fits under the platen and makes it possible to slip papers in from the front when the paper release lever is thrown to the release position. Although this arrangement has worked satisfactorily in the instance cited, the operation of inserting the check is slow and each check must be positioned by hand to secure alignment with the payroll journal sheets. Of course, the standard typewriter equipment is less expensive than the electromatic. This machine is likewise used for general work.

Other Equipment Needed

Depending on particular circumstances, the amount of typing necessary in the payroll work can be considerably reduced by preliminary use of addressograph equipment. This can be employed for inserting names, etc., ahead of time on time clock cards, pay checks, payroll journal sheets, quarterly payroll tax returns and the individual annual earnings report (Form W-2). Some firms include on the addressograph plate such items as the employee's rate, number of tax exemptions, and standard payroll deductions. We have found, in our organization, that the changes in these items are so frequent that making new plates would be burdensome.

DETACH AND KEEP THIS STATEMENT — UNIVERSAL MATCH CORPORATION

	Pay Ending	Hours Worked: Total	Hours Worked: Time & One Half	Hours Worked: Double Time	Rate	Base Amount	Over Time	Gross Amount	Deductions: O.A.B.	Deductions: With. Tax	Deductions: Ins.	Deductions: Bonds	Deductions	Deductions	Net Amount	Check Number
								(Top stub)								

UNIVERSAL MATCH CORP.

HUDSON, NEW YORK

No 27586

50/323

PAY ROLL CHECK

DATE

PAY TO THE ORDER OF

_____

_____

TO THE FARMERS NATIONAL BANK
50-323 HUDSON, N. Y.

(Body)

_____

_____
AUTHORIZED SIGNATURES

(Bottom stub folds under to provide employee's earnings record as carbon copy of top stub.)

EXHIBIT 1

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The only other items of equipment necessary to the operation of the payroll system described in this article are a check writer and a quarter inch peg strip, eighteen inches long. The only special requirement for the check writer is to have the line of protection three and one half inches from the top of the paper. Many small check writers will not write that far from the top of the sheet. In the system described, the full margin is needed because the earnings stub lies along the top of the check. The peg strip is used in connection with the carbon impression of the stub which, as indicated, comprises the employee's earnings record. Quarterly, these duplicate stubs for each employee are pegboard mounted (shingled) to form the earnings statement. Punching for pegboard use was done at the time of printing of the form.

Forms Employed

A clock card, check and earnings form, and payroll (likewise payroll journal) sheet are all the forms employed in processing and summarizing our payroll. The check form is shown as Exhibit 1, illustrating the check and relating it to the earnings statement form. The same hour, rate, and dollar columns appear on the journal sheet and with the same sequence and spacing. The payroll journal sheet is a 12" x 14" form, printed on 16 pound bond paper. Of course, the size of the form and the number and arrangement of the columns can be varied to suit any accounting requirement. It is important, however, that the width of all the columns be measured in multiples of one-twelfth of an inch. This is necessary to tie in with the twelve-to-the-inch spacing of the ordinary typewriter having elite type. Because the locking of ordinary press forms on set type has an effect upon this spacing, the printing is best done either through a photographic reproduction of a hand-drawn form or, perhaps more conveniently, from a printing plate prepared from a wax plate original.

We have considered having the checks made up in a "snap out" form with a one-time carbon. The cost of this type of printing work would be several times as much as the form used and there is some doubt if greater ease in handling would compensate for the additional printing cost. The size of the check can be varied to suit individual requirements, but it must be such that the punching of the check copy can be arranged to fit the quarter inch peg strip previously mentioned. The earnings stub of our form is

wide enough for four lines of typing, thus providing for employees working at more than one rate of pay.

The Procedure at Work: Advance Preparation

The first step in the preparation of the payroll is to set up the blank checks with pieces of carbon paper cut to fit the folded check. Employees' names are then inserted on the checks by means of the addressograph, printing through the carbon paper onto the check copy. The payment date is placed on each check with a rubber date stamp and the batch, with the carbon still inserted, is laid aside until needed. The next step is to list the names of the employees on the payroll journal sheet, likewise by addressograph and with a "lister" attachment set to allow two, three, or four lines of typing for each employee's name, thus providing for employees working at more than one rate during the week. The variable lister is set on multiples of one-sixth of an inch to work out with the regular typewriter spacing. It takes a little practice, however, to achieve this result. Three copies of the payroll journal sheet, with carbon paper interleaved, are prepared at one time and although we do not get perfectly clean impressions on all, they are quite readable and we prefer to put up with perhaps poor appearance rather than make a separate run of each set of sheets. The time cards are also prepared by using another section of the same addressograph frame.

The One-Writing Operation

The three payroll sheets are inserted in the typewriter with three carbon sheets bound in and extending from the "Total Hours" column across the form to the right edge. This achieves omission of check stub column, "Pay Ending," from the sheets.

Checks are inserted one by one from the front of the carriage as described earlier. The check positioning guides must be carefully placed so that the figures will fall in the proper columns on both the check stub and the payroll sheet. The information called for on the check stub is copied from the time card on which the amount due the employee has previously been calculated, and is reproduced on all forms. The check number has not been printed on the stub but is inserted in the typing process so that it will show on the payroll journal sheet. As the writing of the checks progresses, a second employee runs them through the check protector for the net amount which has been typed on the check stub.

When the payroll journal sheets have been written, all columns must be added and the totals balanced from base earnings across to the net amount. The check protection is proven by running an adding machine tape of the protected amounts shown on the checks. The total so determined must be the same as the total net amount shown on the payroll sheets. The payroll checks are not released from the payroll department until the payroll sheets have been completely added and balanced. After the payroll sheets are balanced and the check protection proven, the check copies are separated from the check itself. Whenever it is necessary to pay off an employee before the regular payday, the payroll sheets must be inserted in the typewriter so that the information on the check stub will appear as a carbon copy on the payroll sheet.

Quarterly Earnings Statement

Use of the check copy as an earnings statement for each period has already served the purpose of eliminating search for the employee's individual ledger card when writing checks.

Accumulated by employees by quarters, these copies further substitute for such ledger cards by providing the necessary quarterly earnings statements for social security tax reporting purposes. To start the record, a file envelope is prepared for each employee from addressograph plates and arranged in clock number order in a file drawer. Each week the check copies are filed to the proper envelopes. As long as the employee's addressograph plate is in the active file, his name will appear on the payroll and a check will be prepared. If the employee has no earnings for the week, the check will be voided, but the carbon copy of the check will still be placed in the individual file. It is important to do this so that each earnings record will represent all periods.

At the end of the quarter, the check copies are removed from each employee's envelope and set up on the peg strip which has been given advance mention. The first week is pegged at the top of the strip and succeeding weeks shingled above at three-quarter inch intervals. The sheets are then bound together by placing two or three strips of Scotch tape from top to bottom of the spread at each side and are removed from the peg strip, ready to process. All columns of figures are added and the totals balanced from "base" to "net" amounts. As a final step, the totals for all individuals are brought together and balanced with the totals of the weekly payrolls for the quarter.

Although balancing the individual earnings with the payroll sheets proves that no check copies have been lost, there is still a possibility of filing one or more check copies in the wrong envelope. Errors of this type can be discovered by scanning the "pay ending" dates as the check copies are placed on the peg strip. Each employee will have one (and only one) check copy for each payday during the entire period of his employment.

Continuation sheets for the federal and state quarterly reports of earnings are prepared from the addressograph plates. The individual's earnings are then typed in the proper column, the sheets added and balanced with the payroll totals—and the job is finished. If the instructions have been followed, it is impossible to be "out" at the quarter's end. Adding and cross footing of each payroll has made it certain that each check stub is correctly cross footed. Cross footing of the individual earnings record eliminates any errors in the addition of this record. The only problem is to copy the correct amount onto the tax returns.

As the quarterly returns are prepared, the names of employees whose earnings *may* exceed $3,000 in the subsequent quarter are noted. The file envelopes for these are "flagged" with a piece of red tape folded over the top of the respective envelopes and a notation of the amount of the accumulated deductions is entered on the face. Each week, as the check copies are filed in this group of envelopes, the O.A.B. deductions are added to the figure noted and, when it becomes evident that the following week will carry the amount over $30, this is jotted down on the employee's time card to be taken care of when pay amounts are calculated.

Results

This system has been in operation somewhat over a year and its workability has been thoroughly demonstrated. It has advanced the completion of our quarterly payroll tax returns by about two weeks. In addition, the time formerly spent in writing up the payroll sheet has been largely eliminated and the time spent in posting the individual earnings has been entirely so. The time saved in posting is, of course, partially offset by the time required to file the earnings record copy of the check. As might be expected, the most important saving has been the time usually spent under most manual methods in balancing one record against the other. This balancing effort may run into uncounted hours as anyone who has handled it will know.

BUDGETARY REVIEW OF PLANT ADDITIONS IN A PUBLIC UTILITY

by RUSSELL G. HOUCK,
Auditor of Affiliated Companies, Edison Light & Power Co., York, Pa.

AN intelligent and accurately prepared forecast of construction and control of expenditures is most essential to the local, group, and system management of a public utility and may likewise be far from inapplicable to industrial companies in these days of plant expansion and relocation.

From the standpoint of the local management, an accurately prepared forecast offers the opportunity of planning the construction program so that maximum efficiency may be obtained from the construction department and economies effected through the ability of the local management to estimate the material requirements in ample time for the purchasing department to ascertain requirements for the system as a whole and to obtain advantageous prices. From the standpoint of the group management, an accurately prepared forecast offers the opportunity of determining the construction requirements of all operating companies within the group and comparing actual expenditures with the forecast in order to control and judge the efficiency of local management. From the standpoint of system management, an accurately prepared forecast offers the opportunity of determining where expenditures may best serve the system and the public interest and also to estimate the monetary requirements so that the financing may be advantageously arranged.

The purpose of a forecast of construction extends beyond its accurate preparation. Adherence to the forecast is essential and actual expenditures must be compared with it. Such procedures bring periodically to the attention of those responsible for forecast preparation and its purposes the amount of over or under forecast expenditures and also educate all concerned in ways which will increase the accuracy of future forecasts.

Preparation of the Forecast

A Forecast of Construction (Exhibit 1) is prepared annually and must be signed by the treasury officer and the operating manager of the local management. It shows all proposed expenditures

EXHIBIT 1

EXHIBIT 2

by department for the forecast year, including uncompleted projects carried over from the previous year and projects to be completed after the current year, all forecast expenditures being allocated by months. For the forecast, the projects of each department (electric department, steam heating department, etc.,) are divided into three groups: (1) major projects carried over from prior years, (2) minor projects of forecast year, and (3) major projects of forecast year.

Major projects (individual projects amounting to $5,000 and over) are further divided into three separate classes or codes as follows:

a. Imperative project which cannot be deferred—work which must be done to protect or continue service.
b. Desirable project to increase revenue.
c. Desirable project to improve service or effect operating savings.

All projects are given preliminary estimate (P.E.) numbers in order to classify all property projects in the annual forecast so that they will coincide with the accepted fixed capital accounting system prescribed by the Federal Power Commission and state regulatory commissions. The preliminary estimate numbers shown below are used for electric departments and steam heating departments and it can be readily seen that all construction projects are easily classified according to the work to be done. An industrial company's classifications would, of course, be different and free of regulating restrictions but might well be fully as extensive in many cases. The numbers for the two departments mentioned follow:

Electric Department		*Steam Heating Department*	
	Generation		
P.E. 1	Hydro-electric generating stations	P.E. 40	Steam plant buildings or structures and equipment
P.E. 2	Steam-electric generating stations		
P.E. 3	Oil-electric generating stations		
	Transmission		
P.E. 4	Transmission lines	P.E. 41	Transmission mains
P.E. 5	Substations and substation transformers		
	Distribution		
P.E. 6	Distribution and street lighting	P.E. 42	Distribution mains
		P.E. 43	Meters and installations

	Electric Department	*Steam Heating Department*
	Distribution (Continued)	
P.E. 7	Meters and installations	P.E. 44 Services
P.E. 8	Services	
P.E. 9	Distribution transformers and installations	
	Other	
P.E. 10	Miscellaneous structures	P.E. 45 Miscellaneous structures
P.E. 11	Miscellaneous tools and equipment	P.E. 46 Miscellaneous tools and equipment
P.E. 12	Office furniture and equipment	P.E. 47 Office furniture and equipment
P.E. 13	Transportation equipment	P.E. 48 Transportation equipment
P.E. 14	Communication equipment	

The scope and detail of the forecast is pretty well indicated by the headings of Exhibit 1 and the foregoing groupings. It is angled toward having down in black and white, on an authorized basis, the "what" and "why" of all projects and the "when" of money requirements to carry them out. The forecast for any particular local unit may run for a considerable number of sheets and, for the system as a whole, will naturally be extensive. Nevertheless, the total effect cannot help but be that of relief from unnecessary detail, for the forecast sets up all projects in a way which renders control possible.

Starting Point: The Work Order

Before going forward from the construction forecast to the principal device employed for progress and expenditure control and review, it may be well to go back and describe briefly the means through which projects are initiated before they are included in the forecast and so thrown up for over-all control. At this point, perhaps, we are nearer general industrial practice. However, with us the work order system through which projects come into being is tied in with regulation.

Utilities are required by the Federal Power Commission and state regulatory commissions to record all changes in their fixed capital (except the purchase or sale of an operating unit or system) by means of work orders or job orders. The form contains the usual description and authorization. Separate orders may be opened for additions to (construction) and retirements from fixed capital or the retirements may be included in the construction work order, providing, however, that all items relating to retirements shall be kept distinct from those relating to construction and provided, further, that any maintenance costs involved in the work

shall likewise be kept distinct. Further, a utility is required to keep its work order system in such manner as to show the nature of each addition to (construction) or retirement from fixed capital, the total cost thereof, the source or sources of costs and the accounts charged or credited.

From the above it can be seen that the work order, with its approved expenditure (A.E.) number and its preliminary estimate (P.E.) number, is the basis of operation of the Forecast of Construction and likewise of the control sheet, Status of Construction Forecast, given as Exhibit 2 and to be described presently. A work order is prepared for each and every project and carries the job from its original forecast to its completion on the status of construction forecast.

Generally speaking, the first step in preparing a work order, after the preliminary survey is completed by the engineering department, is to prepare a field estimate which is a detailed estimate of all materials, labor, and overhead (by account number) required for the project. The work order is then prepared, summarizing the data on the field estimate and is referred to the local management for approval. If the project is over certain maximum amounts, a request for authorization must also be prepared and forwarded to the group or system management for approval before work may be started.

Effecting Month-to-Month Control

As soon as a work order is approved it appears on the Status of Construction Forecast in the month during which it was approved and is carried there until the end of the calendar year in which it is completed. It is by preparation of this latter form monthly that we carry out the control objectives (as distinguished from purely recording or planning objectives) rendered possible by the forecast of construction and the documented work order. The status of construction forecast shows all projects in progress during the year, carrying forward those in the "major" category continuing from the previous year and picking up those initiated each month. No project is dropped from this status report within the year but, if completed or canceled, is carried forward with appropriate notation until the close of the calendar year. The status report maintains the same grouping of projects by departments as the forecast itself and is signed each month by the operating manager of the unit.

A glance at Exhibit 2 will show that the first money columns are for original and revised forecast amounts for each project. This is the initial control feature, i. e., up-to-date figures for present construction plans. Each month the construction program is reviewed and corrected to reflect the latest available information. Where revisions are made to the original forecast it is necessary to indicate in the "Forecast Revised to Date" column the revised amount opposite the applicable item.

As in the case of the construction forecast, itself, the status report needs little explanation as to purpose and handling. Lacking the detail of months which the forecast carries, the status report nevertheless carries data which will adequately test the consistency of the forecast and force revision of the latter, if needed. In these connections, the unexpended balance column, as divided between the current and later years, and the total estimated cost column, as compared with forecast and authorized amounts, are properly watched with considerable care.

Under the recommended construction authorization procedure, an overexpenditure should never occur. If, through error or inadvertence an overexpenditure should occur, it should be shown in red figures in the unexpended balance column and thereafter steps should immediately be taken to obtain the required increase in authorization.

COMING ARTICLES

In the *N. A. C. A. Bulletin*, November 15, 1948

Let's Look at the Records
by Eugene R. Harrison

What Will Accounting Machines Do?
by Joseph S. Glickauf, Jr.

Side Lights on Method Analysis in the Mechanized Office
by Tracy W. Simpson

CONTROL OF ACCOUNTS PAYABLE BY PUNCHED CARD METHODS

by R. W. DONALDSON,
Member of Staff, Controller's Office,
Armstrong Cork Co.,
Lancaster, Pa.

ONE of the major departments of the accounting office, ordinarily recognized as a unit with its own special problems, is the accounts payable section. If a business is sizable, a great deal of manual labor is involved in vouchering invoices, setting up schedules of due dates, and charging the proper accounts with expenditures. This paper has to do with the description of a change from wholly manual procedures, which put the larger part of this accounting work on tabulating machines, reduced the amount of clerical effort involved and, at the same time, made available to the other accounting sections a greater amount of analytical information within a shorter period of time. The system to be described is now handling 1,000 invoices per day and can be successfully applied to greater or smaller loads. This system achieves continuous, systematic processing of invoices, up-to-date and automatically proven charge data susceptible of analysis at any time in almost any direction, and elimination of many of the more onerous tasks of vouchering.

Initial Manual Procedures and Coding

The pretabulating procedures adopted do not perhaps differ greatly from other orderly procedures in manual or mechanized systems. However, they contribute to effectiveness and are properly mentioned at the start. Invoices are received by a schedule clerk who detaches and destroys all but the original copy to avoid possibility of duplicate payment. A rubber stamp form (Exhibit 1), providing for recording date of receipt and significant further control data, is placed on the face of the invoice. This information is entered manually. Date of payment (close of discount period) is first inserted. The invoices are then distributed among the invoice clerks who check them with the purchase orders for agreement as to discount terms, quantity, price, description of material, and freight instructions. If everything is in order, the respective clerks will initial the appropriate blocks on the stamp

form. If not, the discrepancies are referred to the purchasing agent. The next steps are determination of discount, insertion of the invoice amount in the body of the stamp, and insertion of code data showing the accounts to be charged. The last line of Exhibit 1 illustrates this. The invoice clerk inserts the date this information is applied and initials the invoice, indicating the approval of the invoice for payment. Vendors' extensions which up to now have been assumed correct are verified by the extension clerk who also initials the stamp.

INVOICE STAMP

Billed or received: 7/10/48—1545 — Jul 26, 1948 Invoice Received

Extensions: J. R. — Prices: A. B. — Material: A. B.

Terms: 2% 10 days — Shipping Point: FOB Factory

Payment Date	*Invoice Approval*	*Bank No.*	*Voucher No.*
7/25	R. D.		7-1500

120	131	15	00	001	000		500	00

EXHIBIT 1

The invoices are then passed to the control clerk. The control clerk reviews all work done on the invoice up to this point to catch any errors in accounting codes, in transfer of figures to the stamp, omission of discount, or taking of discount not authorized. He then sorts the invoices by vendors and due dates. All invoices in this particular batch for a single vendor and a single due date are stapled together and a voucher number is applied on the *first invoice only* of each stapling. This voucher number acts as the control for all invoices stapled to it. The numbers start with one each month and are preceded by a number indicating the month. For example, the first voucher number in January would read 1-1, in February 2-1, etc.

Punching the Cards

The invoices thus grouped and identified are sent to the tabulating department as rapidly as a reasonable number have been accumulated. Each delivery to the tabulating department is accompanied by a control slip showing the voucher numbers included, the date of payment for each voucher, and number of invoices under each voucher number. The key punch operator punches a tabulating card (Exhibit 2) which records the follow-

EXPENSE DISTRIBUTION AND ACCOUNTS PAYABLE
ARMSTRONG CORK CO
PUNCH "I" IN 52 ON CARDS WITHOUT ACCOUNTS PAYABLE INFORMATION
CODE-2: 1-INV. DISC. 2-FREIGHT 3-CREDIT
IBM 733593

EXHIBIT 2

VOUCHER

CODE
1 - INVOICE DISCOUNT
2 - FREIGHT
3 - CREDIT

ARMSTRONG CORK COMPANY

LANCASTER, PA.

John Jones Manufacturing Co.,
500 Main St.,
Philadelphia, Pa.

APPROVED FOR PAYMENT

VOUCHER NO.	ACC'T PERIOD	DUE DATE NO.	DUE DATE DAY	INVOICE DATE MO.	INVOICE DATE DAY	CODE	AMOUNT	DEDUCTION	NET AMOUNT
1343	04	04	09	03	31	1	40555	406	*
1343	[illegible]	04	09	[illegible]	31	1	33484[illegible]	404	
1343	04	04	09	03	31	1	2498	25	
POSITION 14	3		2		1		917304 15	9172 16	908132 * 11

FORM 122 8-47

EXAMINED AND FOUND CORRECT

EXHIBIT 3

Voucher Register

ARMSTRONG CORK CO. VOUCHER NO. 501138757 DATE 4 09 48

	Due Day Payment	Acct. Period	Voucher No.	C. P. D.	Control Source	Dept.	Oper.	Class.	Net Amount	Job No. - M. D. - Pur. Ord.	P. M. No.
	14	3		4	5	3	4	5	11	12 13	
V REG	4 09	04	1340	172	10404	31	000000		1650		
	4 09	04	1340	172	02101	4	000000		28768	93548 1	
	4 09	04	1340	172	10404	31	000000		2340		
	4 09	04	1340	172	02101	4	000000		4709	93547 1	
	4 09	04	1340	172	02101	4	000000		2559	93531 1	
	4 09	04	1340	172	02101	4	000000		18735	2[illegible]	

EXHIBIT 4

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If

ing information in position sequence indicated, *for each accounting code shown on each invoice.*

1. Invoice date
2. Due date
3. Accounting period to be charged with expenditure
4. Company, plant, or division to be charged
5. Control account (general ledger control)
6. Source of expense (supplies, telephone, travel, etc.)
7. Department to be charged
8. Operation within the department or work center
9. Classification of expense, e.g., maintenance, etc.
10. Special—described in the following paragraph
11. Net amount of invoice
12. Project number — when assigned by engineers or research departments
13. Purchase order number
14. Voucher number
15. Gross amount of invoice
16. Amount of discount, freight, or vendor's credit

If there is only one code to be charged on an invoice, the above positions are punched to record the indicated information with the exception of position 10. If there is more than one accounting code to be charged on the invoice, then detailed cards punched for each coding will have the "0" in number 10 position punched. An additional card is made up for the invoice itself showing the information required in positions 1, 2, 3, 11, 14, 15, and 16, i.e., everything except the charges reflected on the detail cards. This plan makes it possible, through adjusting the wiring, to drop the cards with number 10 position blocked out, thereby deleting distribution information from certain accumulations such as the determination of the total cash expenditures for the month and the recording of total payments by vendors' accounts.

In order to insure accuracy in punching, each pack of cards corresponding to a pack of invoices sent from the accounts payable section is run through the tabulating machine to obtain the totals of three positions on the cards, i.e., gross amount of invoices (position 15), discount or other deductions from the invoice (position 16), and net amount (position 11). If the first amount less the second amount equals the third, it is assumed the pack is in balance.

Machine Preparation of the Voucher

It will have been noted that up to this point no totals by vendors have been brought into being. The cards are now sorted by voucher number and the vouchers themselves (Exhibit 3) in which payment is made are prepared in triplicate by machine listing of all cards, sorted to voucher number. The following information is shown:

1. Voucher number
2. Accounting period
3. Due date
4. Invoice or invoices by date (for identification by the vendor)
5. Amount (gross)
6. Deduction for discount, credit, or freight
7. Net amount to be remitted

The triplicate vouchers are sent to the accounts payable section where the names and addresses of the respective vendors are typed on. The vouchers so completed are audited against the invoices (from which they originated by way of the tabulating cards), are approved for payment, and the copies separated. The original is filed by due date and becomes a tickler file and the basis for issuing remittance to the vendor. The second copy is attached to the invoice for filing numerically and the third copy is filed alphabetically by vendor and becomes the index to the numerical file. We have found many uses for the third or index copy of the voucher, such as accumulating total purchases from particular vendors for use by the selling departments interested in reciprocity sales, for reconciling vendor's statements at the end of the month, and for checking out auditor's confirmations received from vendors.

The original or vendors' copies of the vouchers are taken from the file on due dates and sorted alphabetically. All vouchers for one vendor are stapled together with an adding machine tape on top showing the total and a single check is prepared for this amount.

Daily and Monthly Records

Each day's work is closed off with invoices received up to noon. The voucher register is prepared on a daily basis by the tabulating department (Exhibit 4). Like the voucher, it is a machine listing and shows all items by voucher number, due date, account-

ing code, net amount to each code, and net total of each voucher. The punched cards are then sorted into accounting code sequence and a daily report of charges by account is then prepared. This report (by control accounts) is distributed to the departments interested in reviewing charges on a daily basis. To accumulate a detail which will balance with accounts payable at the end of the month, all cards showing payment dates scheduled for the following month are sorted from the pack daily and a listing made. This enables the accounts payable section to check with the unpaid total at the end of the month as shown by the general ledger.

The cards, containing the full charge detail indicated earlier, are then filed in anticipation of the monthly closing, at which time they are put through the machines which are wired to "pull" the following information from them:

1. Accounts payable posting
2. General commercial and selling expense distribution
3. Manufacturing expense ledger
4. Posting summary (total by accounts)
5. Expense controls
6. Operating statement (for combining with payrolls, etc.)
7. Balance sheet (affected accounts)
8. Comparison of actual against budgeted allowance of expenditures by operation for foremen and superintendents
9. Insurance information
10. Tax information

Speed and Flexibility

This somewhat brief description, together with illustrative exhibits, may serve to indicate the accuracy, speed, and flexibility with which detail required by other departments is accumulated and processing of invoices and payment is achieved. The system has been reviewed by representatives of a number of other companies and has been found by them to represent a major step forward in the handling of accounts payable work. It is difficult to do more than indicate within the compass of the present paper the possibilities inherent in machine tabulating of accounts payable data. For us, the installation has proven worth while in terms of stepped up routine and available control information provided with respect to all charges originating outside the company.